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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/067,243	02/07/2002	Hiroyasu Nishiyama	520.41151X00	6572

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EXAMINER

MCLEAN MAYO, KIMBERLY N

ART UNIT	PAPER NUMBER
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2187

DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/067,243

Applicant(s)

NISHIYAMA, HIROYASU

Examiner

Kimberly N. McLean-Mayo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on December 22, 2003.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-4, 6 and 7 is/are rejected.
7) ☒ Claim(s) 5 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The enclosed detailed action is in response to the Amendment submitted on December 22, 2003.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Santhanam (USPN: 5,704,053) in view of Nguyen (PGPUB: 2003/0145314 A1).

Regarding claim 1 and 4, Santhanam discloses a data prefetch method for generating a prefetch instruction for a reference to an array in correspondence with a cache line when values of the array used as indices for a program of making reference to an array increase or decrease in accordance with a predetermined rule and a rate of increase or decrease is within a predetermined range, in a compiler of a programming language for generating an instruction to a microprocessor having a prefetch instruction (Figures 8-12; C 4, L 36-38; C 11, L 16-67; C 12 – C 22; C 23, L 1-25). Santhanam does not explicitly disclose prefetching when values of an indirect reference array used as indices for a program of making indirect reference to an array increase or decrease in accordance with a predetermined rule and a rate of increase or decrease is within a predetermined range. However, Nguyen teaches the concept of prefetching when values of an indirect reference array used as indices for a program of making indirect reference to an

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array increase or decrease in accordance with a predetermined rule (cyclic dependency pattern) and a rate of increase or decrease is within a predetermined range (stride) (Pages 4-5, Sections [0051] – [0052], Sections [0042-0048]; Figure 4). This feature provides an efficient method of prefetching data for indirect reference patterns. Hence, one of ordinary skill in the art would have been motivated to use Nguyen's teachings with the system taught by Santhanam for the desirable purpose of efficiency and for improving memory access time by prefetching data having indirect reference patterns.

Regarding claim 2, Santhanam and Nguyen disclose determining the increase or decrease in the values of the array of indirect reference used as the indices by analyzing a directive described in the source code (Santhanam - C 11, L 49-58 - address expressions associated with the memory references).

Regarding claim 3, Santhanam and Nguyen disclose determining the increase or decrease in the values of the array of indirect reference used as the indices by analyzing an option designated to the compiler (Santhanam - loop body analysis option – Figure 10).

Regarding claim 4, Santhanam and Nguyen disclose determining the increase or decrease in the values of the array of indirect reference used as the indices by analyzing an expression of defining an element of the index array (Santhanam - C 11, L 16-49 – BIV).

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Regarding claims 6-7, Santhanam discloses a compiler for compiling a program executed on a computer having a prefetch instruction for transferring data from a main memory to a cache memory in parallel with execution of another instruction comprising a process of translating a source program in a loop into an intermediate language (C 4, L 46-49); a process of recognizing a loop structure of the loop on the basis of the intermediate language obtained by translation and generating a second intermediate language [low level intermediate code representation] and a loop table [loop unrolling] (C 4, L 49-53; C 9, L 48-58; C 10, L 23-27, L 49-51); a process of analyzing the loop with reference to the generated second intermediate language and loop table, recognizing indirect references in the loop and generating a third intermediate language [expressions generated in the loop body analysis] (loop body analysis; C 11, L 6-67; C 12, L 1-46); a process of generating a prefetch instruction on the recognized indirect reference by referring to the generated third intermediate language and the loop table (Figure 9, References 93-97). Santhanam does not disclose determining values of an indirect reference array used as indices for a program of making indirect reference to an array increase or decrease in accordance with a predetermined rule and a rate increase or decrease is within a predetermined range.

However, Nguyen teaches the concept of prefetching when values of an indirect reference array used as indices for a program of making indirect reference to an array increase or decrease in accordance with a predetermined rule (cyclic dependency pattern) and a rate of increase or decrease is within a predetermined range (stride) (Pages 4-5, Sections [0051] – [0052], Sections [0042-0048]; Figure 4). This feature provides an efficient method of prefetching data for indirect reference patterns. Hence, one of ordinary skill in the art would have been motivated to use Nguyen's teachings with the system taught by Santhanam for the desirable purpose of

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efficiency and for improving memory access time by prefetching data having indirect reference patterns.

Allowable Subject Matter

5. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

6. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

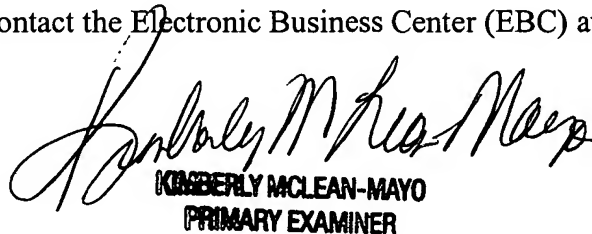
Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly N. McLean-Mayo whose telephone number is 703-308-9592. The examiner can normally be reached on M-F (9:00 - 6:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 703-308-1756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



KIMBERLY MCLEAN-MAYO
PRIMARY EXAMINER

Kimberly N. McLean-Mayo
Examiner
Art Unit 2187

KNM

March 19, 2004